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ABSTRACT

Harvard "Project Zero" is an interdisciplinary inquiry into problems connected with education, understanding, and creativity in the arts. The project conducts basic and applied research, an arts orientation program, and a summer course in arts management with the Harvard Business School. The chief research activities of the project are: investigation of the symbol systems peculiar to the various arts, experimental analysis of the cognitive and manipulative skills constitutive of different arts and media, and testing and development of methods of nurturing and improving artistic abilities. The ultimate goal is improvement in art education at all levels. This implies not only researches into symbol systems, perceptual and motor skills, and problem solving in the arts, but also practical criticism of the teaching methods, programs, and presentations of institutions concerned with the arts, such as schools, museums, and universities. (Three related studies in music are described as illustrating the sorts of conceptual, psychological, and curricular researches currently underway.) (Author/GT)

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HARVARD PROJECT ZERO

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Technical Report No. 1

HARVARD PROJECT ZERO:

A FRESH LOOK AT ART EDUCATION

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Abstract

Harvard Project Zero is an interdisciplinary inquiry into problems connected with education, understanding, and creativity in the arts. The Project conducts basic and applied research, an arts orientation programme, and a summer course in arts management with the Harvard Business School.

The chief research activities of the Project are: (1) investigation of the symbol systems peculiar to the various arts; (2) experimental analysis of the cognitive and manipulative skills constitutive of different arts and media; and (3) testing and development of methods of nurturing and improving artistic abilities.

The ultimate goal is improvement in art education at all levels: children, adults, artists, audiences, and management. This implies not only researches into symbol systems, perceptual and motor skills, and problem solving in the arts but also practical criticism of the teaching methods, programmes, and presentations of institutions concerned with the arts such as schools, museums, universities, and other organizations.

These aims and activities are discussed relative to some popular misconceptions about the nature of art and the psychological processes involved. Especially prejudicial is the tendency to view science as the realm of truth, facts, and understanding versus art as the realm of subjectivity and emotion.

Three related studies in music are described as illustrating the sorts of conceptual, psychological and curricular researches currently underway.

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Under the wry title, "Project Zero"[1], faculty and graduate students in education, philosophy, psychology, mathematics and music at Harvard are confronting the basic problems of education for the arts.[2] Initiated by the Harvard Graduate School of Education in 1967 and funded by grants from the National Science Foundation, the Old Dominion Foundation and the United States Office of Education, Project Zero is an outgrowth of Director Nelson Goodman's work on the general theory of symbols which led to the publication of Languages of Art (Indianapolis: Bobbs-Merrill, 1968).

1. Background: The Theory of Symbols

Everywhere our experience is mediated by linguistic and non-linguistic symbols; that is, things used to "stand for" or refer to other things and requiring interpretation to be understood. Each morning, for example, I survive a number of complex symbol situations with a minimum of confusion. I read a newspaper before leaving my apartment (warmly designated "401"). Invariably, I press the familiar "1" elevator button, and on my way out check a mail slot labelled "V.A.Howard" without ever finding myself in it. Thereupon I cross the street dutifully between two white stripes promising a measure of (legal) safety. I wait at a designated spot for a bus marked

[1]For purposes of writing this report, permission was granted to quote or paraphrase from a collection of unpublished memoranda (hereafter cited as "P-O" or "internal memorandum") compiled by Nelson Goodman, Howard Gardner, David Perkins and Paul Kolers. These records are not available for public distribution. Wherever possible, references are to works published or in press.

[2]Presently there are twelve part-time research associates and assistants connected with the Project. Several are proficient in one or more of the arts, and all have special research competencies ranging from applied mathematics and computer techniques to developmental psychology, philosophical analysis, and logic. The group also includes a musicologist and a specialist in the photographic arts. Individuals from schools, museums, and other universities and divisions of Harvard are associated with the Project as consultants or guest lecturers on special topics.

"Harvard Square" which, for those acquainted with the scene, says something about its passengers as well as its destination.

Carrying out this ante meridian routine depends in no small way upon my ability, and that of others, to understand and use various kinds of symbols. The white stripes in the street do not "speak" to me in the same way as my newspaper, the label on my mail slot, or the driver of the bus. Nothing says "Hurry up!" quite like a bus driver, not even my watch. A sign over the exit ordering "Watch your step!" speaks to me of similar things as the white stripes but again, not in the same way.

The essential task of a general theory of symbols is to develop a complete taxonomy of all the kinds of symbolic reference. Words are used to command, inform, or express, to make war or make love. Electrocardiograms show the pattern of heart beats, and novels the patterns of lives. Portraits represent persons and usually express something about them. Scores indicate what pitches to play and scripts what lines to deliver.

Assuming, then, relative ease in recognizing media and most of their messages, what are the symbolic differences between media? What, for instance, distinguishes a picture from a paragraph, graphic representation from linguistic description? It cannot be enough to say that one is in colour and the other in print if only because my typewriter will print in two colours (assuming black to be a "colour"). The symbolic structure of media is a matter of their referential use to represent things, express feelings, issue warnings, describe situations, exemplify formal properties -- all the things that poems and white stripes, number "1" buttons, and portraits normally do.

In Languages of Art, Nelson Goodman analyses media in terms of the

"domination of certain specific characteristics of symbols" (LA, p.264). In literature, for example, the medium is grouped into characters (letters and words), so that for any two characters of the language, a given utterance or written inscription can be determined to belong to at most one of them.

A symbol schema having this property is said to be "syntactically articulate" (LA, pp.152-153.). Standard music notation is similarly articulate, consisting also of an array of disjoint characters (quarter notes, half rests, etc.). Paintings, on the other hand, differ markedly from natural languages and notations in that chips and bits of colour are not unambiguously assignable to definite characters in a syntactically articulate schema like, say, the alphabet. This lack of articulation is called "syntactic density" (LA, p.136), and is a distinguishing feature of many of the symbol systems of the so-called "plastic" arts. Venus on Botticelli's halfshell may have character, but she is not syntactically assignable to a character.

Traditional music notation differs from natural language in being for the most part semantically as well as syntactically articulate. That is, within limits, none of the compliance classes of characters (in this case, sounded pitches corresponding to the notation) in the system intersect; and a pitch by any other name still sounds the same (C♯, D♭). Class intersection and inclusion is a conspicuous and highly desirable feature of all natural languages, however, making possible both the economy and generality of linguistic communication. Thus, while music notation is both syntactically and semantically articulate, English is syntactically articulate and semantically dense. Paintings, unlike descriptions, belong

to symbol systems that are both syntactically and semantically dense. So too does music considered as sound event, even though Western music makes frequent use of notations having the exact opposite properties.

If, for a moment, we think in the old-fashioned way of aesthetic experience as essentially "semiotic", it behooves us to strike for clarity on both sides of the transaction between symbols and people, in syntactics and semantics as well as pragmatics. The theory of symbols focuses on the nature and relations between symbol systems, thus opening the way for the psychological study of their learning and use in artistic contexts. Once we possess a satisfactory taxonomy of the symbol systems of art, we are in a superior position to broach such questions as: What are the psychological conditions for the understanding and production of art? Are there certain"skills" constitutive of proficiency in the arts? If so, how can we identify them; and once we have, how can they be "taught"? Can they be taught at all? Perhaps proficiency in art is a matter of Platonic inspiration after all. Or, as seems more likely, do the arts draw upon the ordinary range of cognitive and motor abilities possessed by most people? What constitutes a "problem" in the arts? How does a problem differ from a "task"? Are the solutions of artistic problems anything like the solutions of scientific problems, say, in the ways in which they are generated? These are but a few of the questions the staff of Project Zero is attempting to refine and answer.

2. Foreground: Factors Affecting the Understanding and Production of Art

The principal research tasks of the Project are: (1) to analyse and classify the types of symbol systems and symbolic reference characteristic

of different art forms; (2) to identify and study experimentally the skills and abilities required for the understanding and manipulation of art symbols; and (3) to investigate methods of nurturing and training those bilities generally and as they bear upon particular arts. Although the ultimate goal is improvement in art education, emphasis throughout is on long term, basic research, aiming at clarification of issues, identification of problems, and proposal of hypotheses for testing. In this context, much attention is given to canvassing and conceptual analysis of the literature and experimental data relating to the concerns of the Project. Contact with working artists is frequent, and staff members, some of whom have elementary or secondary teaching experience, have made reconnaissance visits to schools, conservatories, colleges, universities, museums, community art centers, and other institutions concerned with the arts. Although the Project is not equipped for laboratory experiments, some are being conducted by staff members having access to the necessary facilities.

Before rehearsing some of the salient sub-features of the aforementioned trinity of tasks, two qualifications are noteworthy in advance. First, the stress upon delimiting fundamental abilities is not an attempt to discern a fixed set of atomic skills of "faculties" unique only to the arts. Nor is it an attempt at a logarithmic reduction of aesthetic sensitivity or its cultivation to a number of pat formulae. Rather, the point is to devise "a taxonomy of tasks and of abilities to perform them that is serviceable for our particular purposes, and then investigate how development of some of these abilities may enhance or inhibit the development of others". (P-0, p.12.) Second, it is not assumed that

the requisite abilities for art are drastically different from those required by the sciences. Both art and science call upon the same fundamental human capacities to recognize auditory and visual patterns, perceive rhythm and symmetry, use language, and develop motor skills. Nor is it taken for granted that the arts are all alike. On the contrary, it seems that certain areas of the arts are more like some aspects of science than other arts both in regard to the abilities and types of symbol systems involved. In terms of what a composer does with notation, he may have more in common with a logician than a sculptor. And should it turn out that artists are divinely inspired after all, there is no reason to suppose the gift to be withheld from scientists, though we may wish to reserve judgment regarding technologists.

Among the results of the philosophical analysis of art symbolism, is a series of regulative insights casting doubt on some common assumptions about the arts. The compilers of an internal memorandum put the matter this way:

> Perhaps the most pervasive misconceptions construe art as a matter of immediate experience, emotion, and values in contrast with science as a matter of inference, cognition, and fact. The conclusion is drawn either that the arts are unteachable or that methods for teaching immediate awareness, feeling, and appreciation should be sought. This line of thinking seems to us wrong in its conception of the arts, in its tacit identification of education with teaching, and in each of its alternative conclusions. In part, it derives from venerable but untenable epistemological dichotomies: the "given" or immediate versus the inferred or mediate, the emotive versus the cognitive. In part, it derives from isolating the functions of understanding and evaluation from one another, and absurdly assuming that while understanding is ultimate for science, "appreciation" is ultimate for art.(P-0, p.7).

Vis-a-vis the curious tendency to overrate aesthetic "value" and feeling at the expense of cognition and understanding, Project Zero

tentatively subscribes to the following:

(1) That rather than being opposed, art and science are alike in aiming at understanding, though in different ways and via a variety of symbol systems, linguistic and non-linguistic. The symbol systems of art and science share many syntactic and semantic features cutting across naive divisions between art and science based upon simplis conceptions of their respective aims, fields of reference, or methods.

(2) That "appreciation" and pleasurable feelings are subsidiary to the central function of art as of science which is to increase our understanding of the world through a perceptual grasp of symbols and their referents. Like the products of science, works of art call for interpretation, not mere passive emotional attendance.

Related here is the view that like appreciation, "evaluation" in the sense of rank ordering of works in point of ther "merit" is subsidiary and best treated as an entrée to understanding them. An alternative is to consider appreciation and evaluation as themselves cognitive activities implying conceptual and perceptual skills amounting to connoisseurship in specific areas. Either way seems preferable to thinking of them as pleasurable-response-plus-ranking-procedure as in happily listing race winners at the track.

(3) Preoccupation with aesthetic value judgments has the tendency to divert attention away from the symbol systems and psychological processes of art to the search for fixed standards of judgment on the one hand and to misguided attempts to "justify" art itself on the other. When such standards are located within art works (e.g., 'good' means 'exemplary of style X'), the result is ethnocentric, or at best, ex post

facto pronouncements of little cognitive insight. Similarly obnoxious are attempts to justify art from without, say, by its "social value" - by its capacity to brighten our days, alleviate tensions, sublimate hostilities, and, in general, to sooth our savage breasts. However desirable such effects may turn out to be, they do not justify art but only suggest its calculated use as a social conditioner and palliative of psychological pains.

These and other issues deserve extended treatment. However, this selection of operative hunches is presented here, without supporting arguments, mainly to indicate the orientation and conceptual organization of the Project.

The second general aim of Project Zero is to study the human psychological and manual processes involved in the arts. According to the internal memorandum:

> One of the major questions the Project seeks to answer is whether the linguistic-nonlinguistic distinction has psychological significance, whether different information processing skills are necessary to deal with such different symbol systems and to produce effective art within them. This conjecture receives some unexpected support from the work of physiologists (especially Sperry, 1964) showing how certain brain damages destroy linguistic ability while leaving non-linguistic functions unimpaired. Emphasis on the distinction between the linguistic and the non-linguistic not only raises interesting questions about transfer of learning between and within the two realms, but tends to focus attention upon non-linguistic symbol systems -- kinesthetic, gestural, graphic, etc. -- which as compared with language have been very little studied. Thus the Project has considered Brown and Krauss' work on children's coding abilities (Krauss, 1968), Bruner's work on infant development of manual behavior (1968), and in general questions of motor learning and its interaction with other abilities. (P-0, p. 17)

Researches in these areas are grouped according to whether they deal with so-called "simple processes" which tend to be one-sense-one-

task in nature, like the scanning activity of the eye in visual perception; "complex processes" involving more than one sense and utilizing previously learned behavior such as reading, style detection, and the learning and modification of routines; or "perception of patterns prominent in the arts" which, like rhythm or symmetry, occur in different arts and can be either simple or complex.[3]

Under simple processes, work thus far focuses on "depth cues" in line drawings (Perkins, 1968) and apparent motion as in film effects where the visual apparatus supplements the sequential presentation of neighboring objects to produce the illusion of smooth motion fron onset to offset (Kolers, 1964). Perkins' study of the angles at which three radiating lines are perceived as a "cubic corner" suggests the possibility of parallel studies of depth cues provided by differences in colour and texture independently of identification of whole objects. Similar studies of "directional" and other fundamental properties of auditory stimuli are contemplated.

Among complex processes, several studies of "style" detection and transformation have been conducted (Gardner, 1969 a, b, c). These have to do with children's ability to reproduce a style of story telling or to recognize style similarities in an array of paintings of varying pictorial content. Experiments by Kolers and Perkins (1969) on reading attempt to delimit and determine the effects of well developed linguistic skills on the correct reading of texts mutilated by inversions,

[3]The popular expression "simple processes" is misleading in the suggestion of atomic or non-complex psychological processes. The contrast between simple and complex processes is employed here merely to indicate the hierarchical inclusion of some processes within the relatively broader scope of others. For example, visual scanning is a prominent feature in the perception of whole objects. "Ubiquitous" versus "special" processes is another, though hardly better, rubric.

letter alternations, and other transformations. B. W. White's study (1960) of the recognition of melodies subjected to linear and non-linear transformations undertakes a similar analysis of auditory strategies used to identify familiar tunes.

Rhythm and symmetry are the two most conspicuous patterns prominent in the arts mediating between simple and complex processes. Both are manifested globally and sub-globally in aesthetic contexts ranging from music and architecture to landscape gardening. The experimental literature here is more extensive but much in need of conceptual clarification. Symmetry is frequently confused with simplicity in the literature,[4] and most general definitions of rhythm are metaphorical (e.g., "the whole feeling of movement in music")[5]. Presently, staff members are exploring the logical possibilities of improved rhythm notation to facilitate empirical studies. Worthy of note in connection with rhythm and symmetry are W. R. Garner's studies of the perception and learning of temporal patterns. Among other intriguing things, Garner reports that "...the immediate use of responding does not interfere with the learning of a pattern...nor does it facilitate learning"(1968, p.109). This raises questions about the scope and limits of the "feedback loop" in sensory-motor systems investigated by Held (1963, 1965). Work is also underway to devise a mathematical standard of pictorial symmetry focusing on subjects' ability to recognize, reproduce, and reorganize symmetric patterns.

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[4]D. Handlin (1968), unpublished "Report on Symmetry".

[5]Harvard Dictionary of Music, second edition, Cambridge, Massachusetts: The Belknap Press of Harvard University Press, 1969, p. 729, Rhythm, Column 1.

A connecting thread uniting these special inquiries is a persistent interest in the significance of "routines" or habitual patterns of problem solving in the arts. If practice makes perfect, it can also make rigour unto mortis. Thus it is of considerable bearing to determine how and in what ways deliberately entrenched behavioral patterns can contribute to or inhibit performance in the arts. Among other misleading consequences of an overweaning stress on inspirational, grace-like "creativity" is the discouraging notion that anything like rational decision procedures or a "logic of discovery" is absent if not impossible in art. But it appears that heuristic, problem solving routines are as much a part of original, imaginative, and even rebellious work in art as in science. Just what part remains to be seen.

The third major interest of Project Zero in the methods of art education presupposes and is an outgrowth of the foregoing considerations. The heuristic routines of mature artists, though interesting in themselves, may or may not be sufficient to develop the artistic skills of children or neophyte adults. Accomplished musicians, for instance, may continue to hone their talents on the same set of exercises throughout their careers, but presumably "My Summer Holidays" is a dispensable seasonal exercise for mature literary artists. Hence, interest in art education -- that is, in the methods of conveying and acquiring facility in and understanding of art -- emerges as a natural corollary of the study of the symbol systems and psychological processes of art. Supposing some knowledge of the latter, the question arises, "What are the best methods for developing those skills of problem setting and solving, of decision making and discovery

in the different media of art whether paint, print, sound, gesture, or stone?" The question is impossibly vague unless cast against the background, first, of extensive analytical efforts to understand what is presupposed in asking it; and second, of attempts to establish experimental parameters relative to specific, clearly defined tasks.

It is singularly unproductive to speak of teaching creativity, inspiration, intuition, or even appreciation. We are not required to teach genius how to be ingenious or to prescribe precise routes to wholly emotional end-states. Useful results are more likely forthcoming from an analysis in art contexts of (1) general teaching "methods" like task setting, prescribing procedure, informing, inciting, evaluating, illustrating, and the like; and (2) aspects of the art educational environment such as stress on control and discipline versus permissiveness, becoming aware of one's limitations and strengths, the relative merits of display -- perhaps even imitation -- versus concealment of the instructor's work, the relevance of historical information, examples, and so on. An increasing amount of attention is being directed to these and other aspects of art education, including various testing devices employed by teachers to detect artistic potential.

If this approach to the problems of art education should appear unduly cold-blooded, the alternative is to abandon efforts at a scientific understanding of art. Scientific understanding is of course no substitute for art or aesthetic response, and one suspects detractors of tumbling into the "reproductive fallacy" -- that is, of supposing that explanations must somehow reproduce direct experience of the things they explain (Rudner, 1966). Einstein's famous remark about the relation of

physics to ordinary experience is apposite, namely, it is not the purpose of science to recreate the taste of the soup.

In addition to these research activities, Project Zero also sponsors a series of arts orientation programs. Planned in consultation with professional artists, presentations are designed to acquaint staff members and audiences of teachers, educationists, and the general public with the special problems and decision procedures peculiar to an art form.[6] This is another area in which research is facilitated by feedback from artists and their audiences.

In July 1970, the Harvard Summer School Institute in Arts Administration was initiated in cooperation with the Harvard Business School. Using the case analysis method, courses focus on: basic management subjects; administration of arts organizations such as museums, civic art centers, theatre companies, orchestras, and the like; and the effects on management of artistic concerns. The arts orientation and administration programs fill out the full range of Project Zero's concern with art education for artists, audiences, and management.

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[6]Lecture-performances in the 1969-70 Arts Orientation Series include:

"Still Photography" by Alfred Guzzetti, Assistant Professor of Education and Visual Studies, Harvard Graduate School of Education.
"The Director Who Chooses" by George Hamlin, Loeb Drama Center.
"How Does a Poem Protect Itself?" by Professor I.A.Richards, Harvard University.
"Dance Making: A Lecture-Performance in Modern Dance" by Anne Tolbert and the Dance Circle Company.
"Mime, Mask and Contra-Mask" by Jacques Lecoq, Director, School of Mime and Theatre Movement, Paris.
"From Sign to Sound" by Leon Kirchner, Professor of Music, Harvard University.

3. Musical Postscript

Four studies in music recently begun by staff members are sufficiently far along to permit summary description. All are tentative, subject to radical revision, and merely illustrative of particular musical interests of staff members.

Mrs. J. Bamberger (1969) is investigating some relations between notation, perception and learning in music. For lack of systems of notation, much of the world's music reveals no separation of composition and performance. In lieu of a score, extempore performances involving precise pitches and durations appear to be governed by aurally derived "rules" or habits. These are acquired by listening to many pieces exemplifying certain generalized structures: "the order in which phrases occur, the relationships between phrases (ending, preparation, climax), the general pitch shape within phrases, together with certain points of reference like beginning and ending formulas" (p.3). This suggests "a kind of learning where myriad tunes are reduced to fewer structural designs -- abstract, always operational, generative principles for the invention of more tunes"(p.3). While such learning processes tend to disappear with the advent of notational systems, it is plausible to hypothesize that much of a child's "untaught" musical development proceeds in a similar fashion, rather like language learning, "through imitation to comprehension and production" (p.4). In testing for the presence of an "integrated grammar" of music, Mrs. Bamberger found that "the first two phases of development seem to happen with little formal intervention. The third does not. However, in some informal experiments (e.g. asking 6 to 8 year old children to continue an unfinished melody), I found that the capacity is

often present but unused" (p.5). These speculations suggest at least two things: first, that far greater attention should be paid to early; informal learning processes in music. Secondly, they provide a model of musical learning inverting the usual priorities between learning notation and the auditory apprehension of generalized configurations, particularly in the early stages of musical development.

D.A. Freundlich (1969) takes a "cognitive-developmental" approach to problems of musical perception which in part stresses the psychological significance for music of the theory of symbols. "In language, all of the levels except the semantic are subsidiary. Phonetics, phonemics, morphemics, and grammar are transparent, and we focus on what we're talking about, which is the semantic content. In music, on the other hand, it is syntax itself that is focal. We see through acoustic and theoretical levels of organization and focus on the flow and sequence of the music. Thus, a crucial difference between language and music is at the level of 'hanging things together', which is subsidiary (transparent) in language and focal in music" (pp.9-10). An adequate developmental psychology of music recognizes the autonomy (in Bamberger's sense) of musical perception. It will avoid reducing it either to acquisition seriatim of the various items of conventional music theory, or to acoustical phenomena such as pitch discrimination, intensity discrimination, rhythm, and timbre. Rather, "in our interaction with a piece of music, we begin by making contact with global, diffuse aspects of the music, and develop inwards toward more specific and articulated aspects of the music" (p.5). This is another way of stressing the non-articulate, "dense" character of music as an auditory stimulus. From a developmental stand-

point, the density of symbol systems presupposes the ability to recognize a range of Piagetian "potentialities" or alternate interpretive possibilities ascribable to a symbol. The development of this capacity at different hierarchical levels in children, mature listeners, and musicians would seem to be a presupposition also of "information theories" of musical meaning such as L.B. Meyer's (1956) where the ability to detect deviation from norms typical of a given style or period is considered so essential a part of the significance of music.

From the standpoint of the theory of symbols, the author is investigating expression by musical works of non-musical properties and qualities, e.g., "sad", "ferocious", "nostalgic", "hovering", "soaring", etc. [7] Previous efforts to conceptually analyse expression by music can be conveniently grouped under three headings: Soft Formalism which arques that statements like "This music expresses sadness" are reducible to metaphorical descriptions of the form "This music <u>is</u> sad" intended to elucidate literally ineffable structural features; Hard Formalism which holds that all such locutions are low-level, ambiguous proxies for the literal language of music theory and dispensable, with training, in favour of the latter; and the Iconic Sign Theory which construes metaphorical description generally and expression particularly as elliptical literal simile via the mechanism of the iconic sign. In other words, the music is sad because it is "morphologically" like, or similar to, feelings of sadness.

Against these interpretations it is argued that Soft Formalism

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[7] V.A. Howard, "On Musical Expression", <u>British Journal of Aesthetics</u>, in press.

fails to explain metaphorical possession of expressed properties, and does not distinguish which among innumerable metaphorical properties of music are expressed: a piece might be described as an "old war horse" not for any of its musical features but because of its frequent performance. Hard Formalism errs in ignoring the fact that metaphor is ubiquitous in linguistic description, including music-theoretic contexts, and in hastily assuming that metaphorical descriptions can tell us nothing about musical structures that literal descriptions could not tell us better. The Iconic Sign Theory mistakenly presupposes that "morphological similarity" implies a denoting sign relation between music and other mental or physical processes (that whatever expresses also asserts); and that such similarities, antecedently preceived, explain our use of metaphors in describing music, whereas just the opposite case (that metaphors may generate perceived similarities) is equally plausible.

A more satisfactory alternative is the Exemplification Theory which restricts expression to a subset of metaphorical exemplification.[8] A musical work expresses only those metaphorical properties possessed and referred to by the work as a symbol of a certain kind; that is, solely as music.

Inasmuch as metaphor aids in delimiting structural features, the theory shows how we may be led anew to the music by metaphor rather than away from it.

Also under way is a study of the less common phenomenon of musical

[8] Exemplification is reference from an object to a term denoting that object. For example, a coloured patch functioning as a sample of blue both refers to and is denoted by that term. Exemplification can be literal or metaphorical depending upon whether the term exemplified applies literally, as in the case of the coloured patch, or metaphorically, as in speaking of a blue mood. See LA, pp. 50-67.

denoting. This includes musical representation where denoting of particular things or events (when it occurs) is unaccompanied by a score in standard notation as in electronic music; description where, although a score is involved, the things denoted by the music are ambiguously denoted (e.g., Debussy's La Mer); and naming where notated themes are recoverable from the objects denoted (e.g., Wagner's Sword Motif or musical names).

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Harvard Project Zero is a basic research program at the Harvard Graduate School of Education. Its original charge was to study creation and comprehension in the arts and means toward better art education. A prime objective throughout the Project's history has been to provide a sound theoretical and experimental base for effective education of artists and audiences. The Project began in the fall of 1967 in response to the frank admission that, however much is known about how to educate in science and how to evaluate scientific work, practically nothing is known about the underlying principles of how to teach and evaluate in art. From that challenging "zero" the Project took its name and tasks. Our research methods include rigorous conceptual analysis, investigation of relevant literature, design and execution of key experiments in psychology and other fields, visits to arts education institutions, and application of results to proposing and assessing programs in art education.

Project founder and former director Nelson Goodman's book Languages of Art (Bobbs-Merrill, 1968) has provided important direction in our effort to isolate and investigate basic skills. This work sets forth a "theory of symbols," a broad treatment of elements of communication, embracing words, gestures, diagrams, paintings, poems, musical scores, and so on. Almost all the psychological processes under consideration in our studies of the arts involve extensive operation with and upon symbols of various kinds. These symbols are not merely instruments of communication, but also instruments of cognition, tools in terms of which the mind deals with the perceptual world.

Some of our research has examined the psychological implications of the theoretical models of symbol systems introduced in Languages of Art. For instance, one question is whether different information processing skills are necessary to produce effective art within linguistic, versus nonlinguistic, symbol systems. Another, complementary approach emphasizes problem solving and search strategies in the moment-to-moment perception and production of a work of art. How do subjects search for rhyme words in poetry or explore alternative placements of pieces in collage? A favorite means of developing and testing new models is through the study of errors. By using impoverished or ambiguous stimuli, assigning tasks somewhat too difficult for a subject, or working with brain-damaged subjects, one can elicit patterns of error-making which suggest hypotheses and select between alternative models of a process. These approaches characterize many of the Project's investigations mentioned below in a list of Project members and their particular interests.

Though the development of actual curricula in arts education is not a primary concern, the Project does contribute to the field of practical education. Project members have responded to inquiries and requests to comment on curricula from teachers in the field. Establishment of Harvard Summer School's Institute in Arts Administration resulted from the Project's reply to an inquiry from the director of the Harvard Summer School, and members of the Project staff cooperated in planning the Institute, in preparing material, and in the actual teaching. Consideration consultation has been provided to schools, museums, television, and a variety of arts institutions by members of the Project.

The Project has also sponsored a series of lecture-performances in various media, designed to give the general public and prospective public school teachers and administrators better insight into and attitudes towards artists and the arts. As the series title "Art in the Making" suggests, the purpose of the lecture-demonstrations was to reveal something of the artist's way of working, rather than to display his products. In the presence of an audience free to ask questions, each artist explored alternatives, exposed some constraints of his medium, compared his various efforts, and searched for the right effect, choice by choice.

While maintaining a major concern with the arts and art education, the Project, under its current co-directors, has considerably broadened its field of inquiry and now investigates a whole range of topics in the area of cognitive psychology. One part of the Project has focussed particularly on developmental studies. Among the topics currently being investigated are the emergence of symbolic capacities during the first years of life; the development of literary abilities, specifically the capacity to produce and appreciate metaphors and stories; children's understandings of the various worlds presented on television; the emergence of drawing skills; and the breakdown of various symbol using capacities under various forms of brain damage. The other part of the Project has concentrated on studies in the areas of cognitive and perceptual psychology, ones which utilize both normal adult subjects and gifted artists. Among the topics investigated recently have been critical judgment and the sources of critical disagreement in adults; the thought processes of professional and amateur poets and painters in developing works; the role of geometric principles in visual perception and picture perception particularly, reasoning about everyday matters and the logical difficulties people encounter.

A list of recent papers which can be purchased from the Project is available upon request.